A SYSTEM AND METHODS FOR UNIFIED ROUTING OF MAILPIECES AND PROCESSING SENDER NOTIFICATIONS

Cross-Reference to Related Applications

This application claims the benefit of Provisional Patent Application No. 60/197,699 filed April 18, 2000, and titled *Centralized Forwarding System and Returned to Sender Processor And Associated Methods*.

Field of the Invention

The present invention relates to the field of product handling and, more particularly, to mailpiece handling systems and methods.

Background of the Invention

Not all mailpieces can be delivered to the mail receiver indicated as addressee on the front of a mailpiece such as an envelope, circular, package or publication. Effective mailhandling, therefore, requires efficient procedures for routing mailpieces where an existing forwarding address is on file for a particular addressee and for returning mailpieces worth sending back to a known sender. In addition, a sender will often want to know whether the mail has been

forwarded, and if so, to where. If a mailpiece is returned, a sender may want to know the reason why. This is especially true for the many commercial and publishing entities that send mail to repeat customers or subscription readers. In some cases, the mailpiece is not worth the postage it would cost to return the mailpiece to the sender. This is frequently the case with respect to mailpieces such as weekly magazines, catalogues, circulars, and other publications. Nonetheless, the sender of such items will frequently want to know whenever the mailpiece has not been delivered to the address the sender has on file, as well as the reason for non-delivery. Again, if the mailpiece is forwarded the sender is likely to want to be informed of the forwarding address.

Most mailhandling services have sought to accommodate the above-described demands of their customers, but conventional methods are highly labor-intensive despite attempts over the years to make better use of computers and automated processing technology. The United States Postal Service "USPS", for example, has implemented a Centralized Forwarding System "CFS" to deal with forward mail processing. With this system, the USPS maintains records for households and individuals that have moved to a new address, maintaining each individual record for approximately a year, stored in an old-new address database. The database is accessed by an operator, using a keyboard and display terminal, who enters an "extraction code" (i.e., the first four characters of a

last name and the last three numbers of a street address). If a match is made with a new forwarding address, a label is printed and applied to the mailpiece, usually having a barcode to facilitate subsequent processing.

The USPS has also implemented an Address Change Service ("ACS") that allows mailers to place a sender notification request, in the form of a USPS-approved barcode, signaling the sender's desire to be informed of the forwarding address if a mailpiece is forwardly routed. Traditionally, informing a sender about a forwarding address has been done by the USPS through "3547" processing, named for the form with which a sender requests the notification. The USPS also has traditionally performed return-to-sender ("RTS") processing wherein letters not delivered, but not otherwise suitable for forwarding, are returned to the sender. RTS processing is conventionally carried out in stages, firstly with the mail carrier manually marking the mailpiece to indicate a reason for return and, secondly, returning the mailpiece to the post office where it can be re-mailed to the sender at the address that appears at the upper left front portion or on the backside of the mailpiece. At some offices, RTS mailpieces are processed at a USPS facility on a cancellation device that marks the mailpiece with an indicator of one of eight reasons why the mailpiece is being returned.

For those mailpieces not worth the cost of return postage, the USPS has utilized "3579"

processing, named after another USPS form requesting notification if a mailpiece is not forwarded for some reason but not returned. Such mailpieces are generally weekly periodicals or other bound multi-page mailpieces. With conventional "3579" processing, the USPS removes the exposed page of the mailpiece and returns it to the sender for a postage fee.

These traditional methods utilized by the USPS and similar ones employed by other mailhandling services, as noted, are highly labor-intensive notwithstanding persistent attempts to improve processing efficiency through automation. The USPS's CFS processing, as noted, requires a keyboard operator to enter data in search of a corresponding forwarding address. The USPS is in the process of developing a Postal Address Redirection System "PARS" whereby mailpieces can be read with a multiline optical character reader "MLOCR" to direct mailpieces to a forward destination, but it is as yet unknown how effective PARS is likely to be. Moreover, it is doubtful that the proposed system will process with equal facility intermixed mailpieces composed of letters and flat mail. The USPS defines letters as being larger than 3"wide x 5"long x .007"thick and smaller than 6.125"wide x 11.5"long x .25"thick, and defines flats as larger than letters but smaller than 10"wide x 13"long x .75"thick. Currently, these different sized mailpieces are processed using distinct or separate devices.

In addition, the other conventional procedures employed by the USPS and other mailhandling services remain costly in terms of time and resources. A notice to the sender of a mailpiece forward and the corresponding forwarding address using the USPS's current 3547 processing requires a clerk to photocopy the front of the mailpiece in a separate procedural operation after the manual lookup procedure for ascertaining the forwarding address has been completed and a new forwarding label has been applied to the mailpiece. So, too, the USPS's current 3579 process remains highly labor-intensive. Not only must data be entered manually by a keyboard operator at a display terminal, but after a return address is identified for a magazine cover or similar mailpiece, the cover must be torn off and labeled. The procedure is not complete until each of these torn-off covers are gathered and manually placed in individual envelopes for sending to the original sender.

Summary of the Invention

With the foregoing in mind, the system and methods of the present invention advantageously provide efficient mail processing that, as compared to existing procedures, reduces processing steps and more efficiently automates others. The system and methods provide additionally a higher level of quality and consistency for forwarding or returning mailpieces, indicating reasons for the return, and notifying customers of addressee forwards. The present invention

provides a system and related methods for processing a plurality of intermixed mailpieces, including letters and flat mail, which for one reason or another are not deliverable to the receiver location address indicated on each mailpiece. Some of the mailpieces to be processed are to be forwarded to a receiver forwarding address and some are to be returned to the sender. In addition, some sender's are to be notified when a mailpiece has been forwarded and what the forwarding address is. If a mailpiece is returned, a sender is to be informed as to the reason why. Finally, some mailpieces that cannot be delivered, will not be worth the cost of return postage, but senders nonetheless will want notification of the non-delivery.

The present invention provides a single, unified system for accomplishing each of the described procedures. For each distinct procedure, the system and methods of the present invention eliminate the most labor-intensive steps found in the procedures as currently practiced, while more efficiently automating the remaining ones. These aspects are detailed below in the context of the distinct procedures currently and widely used for mailhandling. It is worth noting, however, that additional efficiencies are achieved by unifying the operations so that distinct procedures can each be effected utilizing the same system and methods according to the present invention. In addition, the system and methods perform equally well on both letter and flat mail, eliminating the cost of maintaining

separate systems for processing distinctly sized mailpieces.

With respect, specifically, to mail forward processing, mailpieces are forwarded in a single operation, beginning with the electronic scan of each mailpiece so that a single-scan image is generated for each of a plurality of mailpieces. Each single-scan image is processed to segment for each mailpiece the receiver location address indicator, sender return address indicator, and ascertain whether a sender notification indicator appears on the particular mailpiece. The receiver location address indicator so imaged can be compared, preferably utilizing an optical character reader and character comparison algorithm, to a stored list of addresses constituting a database of receiver forwarding address indicators. Once the latter indicator is identified, a label is applied to the mailpiece being processed and on it is printed the forwarding address, preferably with a 3-line or more multiline printer so that the operation is completed without the particular mailpiece's ever having left the path of travel over which processing occurs.

The result, as compared to existing systems and methods, is the elimination of manual entry of address indicator data with a concomitant reduction in cost in terms of time and resources. Indeed, it is estimated that as compared to current practices up to about 60 percent of mailpieces processed can be handled without manual keyboard data entry using the system and methods of the present invention. Although the remaining approximately 40 percent will be processed

utilizing operator-supplied data, the processing is achieved with sufficiently more efficiency, perhaps leading to as much as about a 26 percent increase in overall productivity.

Moreover, the single-scan image is stored for subsequent processing. If a sender notification indicator is detected on the mailpiece being processed, the forwarding address indicator can be culled from the stored single-scan image for subsequent use in generating a sender notification notifying the sender that the mailpiece has been forwarded.

Relying further on the combination of single-scan imaging and character comparison algorithms, traditional 3547 processing is similarly made significantly more efficient. A sender notification can be prepared bearing the receiver address location indicator and corresponding forwarding address indicator. The sender notification will be directed to the sender return address indicator likewise culled from the initial single-scan image generated. Again, as compared to current procedures employed by mailhandling services such as the USPS, there are significant efficiencies achieved. Notably, the laborious step of repetitive data entry is reduced. Even more significantly, the need to photocopy a labeled mailpiece to generate the sender notification, as currently done by the USPS, is entirely eliminated. Thus, with respect to this procedure, too, the present invention generates further efficiencies and concomitant cost savings.

Likewise, in place of manually sorting publications and entering data requests to identify a publisher's address in 3579 processing, relevant data groups can be culled from a single image scan of the exposed page of a publication. An image comparison between the scanned image and each of the images stored as part of a current-publications database containing cover page images and corresponding publisher addresses can then be made. When a match is achieved, a sender notification can be generated and printed. The publisher's address will be indicated on the notice generated, obviating the need as exists with current procedures for individually tearing off cover pages and manually putting them in envelopes to be addressed to a publisher once the publisher's address has been identified through manual data entry. Accordingly, even greater efficiencies over existing procedures are achieved.

In addition to allowing single operation processing of distinct procedures, the system and methods of the present invention permit processing of letters and flat mail alike. As described below in detail, the system and methods of the present invention provide a variable speed controller to determine the rate at which mailpieces are fed into the sytem for processing and a stacker alignment to thereby permit both letters and flat mail to be processed on the same system utilizing the same system. This further reduces costs by eliminating the need for multiple equipment

or, alternatively, downtime and reconfiguration for different sized mailpieces.

Brief Description of the Drawings

Some of the features, advantages, and benefits of the present invention having been stated, others will become apparent as the description proceeds when taken in conjunction with the accompanying drawings in which:

FIG. 1 is a schematic block diagram of forward mail processing according to a system and methods of the present invention;

FIG. 2 is a schematic block diagram of RTS mail processing according to a system and methods of the present invention;

FIG. 3 is a schematic block diagram of second pass RTS mail processing according to a system, apparatus and methods of the present invention;

FIG. 4 is a schematic block diagram of "3547" mail processing according to a system and methods of the present invention;

FIG. 5 is a schematic block diagram of offline mail processing according to a system and methods of the present invention;

FIG. 6 is a schematic block diagram of "3579" mail processing according to a system and methods of the present invention;

FIG. 7 is a top plan of a typical letter mailpiece having a return label, stamp, address label,

and postnet bar-code positioned thereon according to the present invention;

FIG. 8 is a top plan of a letter mailpiece having a reason-for-return indicator positioned thereon according to the present invention;

FIG. 9 is a top plan of a letter mailpiece having a receiver forwarding address indicator positioned thereon according to the present invention;

FIG. 10 is a top plan of a 3547 processing sender notification mailpiece according to the present invention;

FIG. 11 is a schematic view of a mailhandling system, including process controller and associated processing elements, according to the present invention;

FIG. 12 is a top plan of a mailhandling system according to the present invention

FIG. 13 is a side elevational view of a reverse image processor according to the present invention;

FIG. 14 is an elevational view of a scanned image of the front side of a letter mailpiece along with a superimposed image of a reverse-sided sender return address indicator according to the present invention;

FIG. 15 is a fragmentary perspective view of a mailhandling system having a reverse image processor according to the present invention;

FIG. 16 is an elevational view of a scanned image of the front side of a letter mailpiece along

with a superimposed image of a reverse-sided sender return address, and the corresponding image after it has been properly realigned by reverse image processing according to the present invention.

Detailed Description of Preferred Embodiments

The present invention will now be described more fully hereinafter with reference to the accompanying drawings which illustrate preferred embodiments of the invention. This invention, however, may be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey the scope of the invention to those skilled in the art. Like numbers refer to like elements throughout. The prime notation, if used, indicates similar elements in alternative embodiments.

FIGS. 1-6 and 11-16 illustrate a system **10** and related methods **100, 200, 300, 400, 500, 600** for processing a plurality of mailpieces which for one reason or another are not deliverable to the receiver location address indicated on each mailpiece. Some of the mailpieces to be processed are to be forwarded to a receiver forwarding address and some are to be returned to the sender. Some sender's will desire to be notified of the forwarding address when a mailpiece has been forwarded. If a mailpiece is returned, a sender is to be informed as to the reason why. Additionally, for some mailpieces that cannot be delivered but are

not worth the cost of return postage, the senders nonetheless will want notification of the non-delivery.

The present invention provides a single, unified system for accomplishing each of these procedures. More specifically, the system and methods of the present invention reduce processing steps and more efficiently accomplish others as compared to conventional procedures. The system and methods described herein, moreover, facilitate linking one or more destination printers via a communications network so that mailpieces can be processed at one location and corresponding labels printed at any of a number of remote sites by networked destination printers. Substantial efficiencies are generated by unifying and linking via a network the various operations related to mail routing and processing sender notification. Moreover, efficiencies are enhanced in so that distinct procedures can be effected utilizing the same system. In addition, the system and methods perform equally well on both letter and flat mail, eliminating the cost of maintaining separate systems for processing distinctly sized mailpieces.

The system **10** preferably includes a mailpiece feeder **11** that individually feeds a plurality of intermixed mailpieces. Each of the plurality of intermixed mailpieces has separate receiver location address indicators **62**, sender return address indicators **72**, and sender notification indicators **74** positioned thereon (see FIGS. 7-10 and 12). The system **10** also includes a mailpiece transporter **20** in position to

receive from the mailpiece feeder **11** each of the plurality of mailpieces and transport each therefrom along a predetermined path of travel **21**. The system **10** further includes a mailpiece scanner **25** placed downstream from the mailpiece feeder **11** and adjacent the mailpiece transporter **20** along the path of travel **21** of the plurality of mailpieces to scan the separate receiver location address indicators **62**, sender return address indicators **72**, and sender notification indicators **74** of each of the plurality of intermixed mailpieces to thereby create a single-scan image of address indicators and notification indicator data for each corresponding mailpiece (FIGS. 7-9). As described more fully below, the single-scan image is generated by an optical character reader, digital camera or other comparable device in order to image address and notification data (i.e., receiver location address indicator **62**, sender return address indicator **72**, and any sender notification indicator **74**) and capture the data electronically as the mailpiece traverses the path of travel **21** in a single pass. The image so generated, moreover, is processed so as to describe the address block attributes "ABA" of each corresponding mailpiece. The resulting ABA provides in the form of digitized code a representation of mailpiece attributes, including the physical aspects of the mailpiece and its address area, thereby serving as a type of mailpiece "fingerprint" that can be stored, sorted, and retrieved in subsequent processing steps.

A mailpiece labeler **28** in this embodiment of the system **10** is also positioned downstream from the mailpiece scanner **25** and adjacent the mailpiece transporter **20** along the path of travel **21** of the plurality of mailpieces in order to label each of the plurality of mailpieces with a preselected routing indicator.

The embodiment moreover further includes a process controller **16** in communication with the mailpiece scanner **25** and mailpiece labeler **28** to receive the single-scan image, separate the image into discrete data groups of at least address indicators **62**, **72** and sender notification indicator **74**, instruct the labeler **28** to label each of the plurality of mailpieces with a preselected routing indicator **84**, and generate a sender notice **90** when desired (see FIGS. 10-12). The process controller **16** includes a forwarding address determiner **17** responsive to the receiver location address indicator **62** data group of each of the plurality of mailpieces to determine when the receiver address location indicator **62** of a corresponding mailpiece corresponds to one of a predetermined list of forwarding addresses and thereby instruct the labeler **28** to label the mailpiece with the corresponding forwarding address indicator **84** (see FIG. 9). The predetermined list of forwarding addresses is preferably a database **701** of forwarding address indicators in communication with the forwarding address determiner **17** of the process controller **16.**

The process controller **16**, moreover, includes a return-to-sender determiner **18** responsive to the sender return address indicator **72** data group of each of the plurality of mailpieces to determine when a corresponding mailpiece is to be returned to sender and thereby instruct the labeler **28** to label the mailpiece with the corresponding return address indicator **76**.

Also included as part of the process controller **16**, is a sender notification determiner **19** responsive to the sender notification indicator **74** data group of each of the plurality of mailpieces to determine when to generate a sender notice **90**.

This embodiment of the system **10** can also include a mailpiece stacker **30** that is positioned downstream from the mailpiece transporter **20** to receive each of the plurality of the intermixed mailpieces from the mailpiece transporter **20** and to direct each of the mailpieces to one of a plurality of preselected stacking positions according to whether the particular mailpiece is to be returned to a mailcarrier for delivery or be subjected to additional processing.

As already noted, the system **10** preferably scans mailpieces electronically using an optical character reader or similar device in order to generate a single-scan image of the address and notification data **62, 72, 74** and capture the data electronically as the mailpiece makes a single pass along the path of travel **21** of the mailpiece transporter **20**. With the data thus captured, software techniques as understood by those skilled in the art can easily segment the data

so as to isolate for distinct processing purposes the receiver location address indicator **62**, sender return address indicator **72**, and any sender notification indicator **74**. Having captured and segmented the data, the processor **16**, for example, can utilize character comparison techniques to search for a match between the receiver location address indicators and receiver forwarding address indicators using a character image matching algorithm. The single scan image is used to generate a label that is then applied to a mailpiece. Thus, rather than processing in multiple steps requiring manual data entry, mailpieces are scanned, an image generated, and a label having the forwarding address indicator **84** thereon is applied to the mailpiece so that each mailpiece is processed in one complete cycle of system **10** operation.

Mailpieces to be returned to sender can similarly be processed in one cycle with each mailpiece that is to be returned being completely processed as it traverses the path of travel **21** only once without any of the plurality of mailpieces leaving the path of travel **21** along which processing occurs. The system and methods of the present invention process mailpieces to be returned to sender by comparing the receiver location address indicator with a stored list of addresses for which no forwarding address has been filed. For each stored address there preferably is also stored a corresponding reason-for-return indicator. Preferably, the addresses and corresponding reason-for-return indicators are stored as a database

702 in communication with the return-to-sender determiner **18** of the process controller. If a match is made, the mailpiece is labeled for return to sender and marked with the reason for return, as described more fully below. Otherwise, the address and reason-for-return are entered into the database **702**, as for example, by a key punch operator at a video display terminal and keyboard **97**, and stored for subsequent mailpiece processing. In either event, the mailpiece receives a label containing the sender's return address indicator **72** and a reason for the mailpiece's return. This contrasts, the conventional systems and procedures used by mailhandling services such as the USPS whose forwarding procedures have relied exclusively on manual entry of data indicators by keypunch operators using video display terminals.

FIG. 1 illustrates, in perhaps greater detail, the method **100** of the present invention that can also be implemented by the system **10** for processing mail for forward routing. The method **100** is initiated by feeding mailpieces for scanning (Block 101) to generate a single-scan image of the receiver location address indicator **62** and any other indicators, such as barcodes, that may be positioned on a mailpiece undergoing processing. The single-scan image is segmented so that the individual address blocks having receiver location address indicators **62** and sender return address indicators **72** are separably identified along with any barcodes or other indicators that may appear on the same mailpiece (Block 103). In the

subsequent step (Block 104), the address block with address indicators **62, 72** is processed, preferably utilizing an optical character reader ("OCR") as well understood by those skilled in the art. The OCR engine (Block 105) compares the receiver location address indicator **62** with a preexisting set of forwarding addresses to determine whether the mailpiece is to be forwarded. In the context of United States mail handling, the determination made by the system **10** and related method **100** can be facilitated by using the standard USPS "ZIP + 4 Lookup" system (Block 106). The OCR engine also searches the segmented image for a sender notification indicator **74**, such as an address correction request on a mailpiece (Block 107). Again, in the context of domestic United States mail handling, the USPS has instituted the Address Change Service ("ACS") whereby a mailer may include on the mailpiece a USPS-approved message above the receiver location address requesting the service to notify the mailer when a mailpiece is forwarded (See USPS Publication 8, at pages 9-13). Thus, consistent with the ACS, the system **10** and method **100** not only determine whether a forwarding address match exists (Block 108), but also ascertain whether a sender notification **90** should be generated (Block 109) according to whether a sender notification indicator **74** was present on the mailpiece being processed.

If a successful match is obtained (Block 110), a label is applied to the mailpiece, and on it is printed a receiver forwarding address indicator **84** so

that the mailpiece can be appropriately forwarded. Preferably, the system **10** will include as part of the labeler an ink jet printer **29** or other printing device as understood by those skilled in the art, having the capability to print at least three discrete lines simultaneously so as to permit the appropriate forwarding address indicator **84** data to be printed on the label (Block 111) as the mailpiece travels once past the printer on the mailpiece transporter **20**. Coupled with the ability to scan (Block 101), segment the single-scan image (Block 103), and determine a forwarding address match (Block 108), the system **10** allows the mailpiece to be completely processed on a single pass without the mailpiece leaving the path of travel **21** of the mailpiece transporter **20**. This contrasts with conventional systems and methods which require manual keypunch entry of data in separate, additional processing steps, leading to higher costs and slower forward mail processing.

If it is determined that there is no match (Block 108) because there is no forwarding order with address on file, or for any other reason such as an incorrect address or no such addressee at the address, then the mailpiece is processed (Block 113) as not having a forwarding address on file and a determination is made whether the mailpiece is to be processed for a return to sender (Block 114). If so, the mailpiece is then submitted for return-to-sender (RTS) processing (Block 115). Preferably, as part of RTS processing, the mailpiece is labeled below the sender return

address indicator with an indicator such as a barcode corresponding to the receiver location address indicator. The mailpiece is also labeled above the sender return address indicator with a barcode corresponding to the sender return address indicator **72**. In accordance with this specific embodiment of the present invention, the mailpiece can be returned to a mailcarrier to attempt a second-time delivery of the mailpiece. If delivery is again unsuccessful, the mailcarrier simply marks out the bottom barcode and the mailpiece is returned for subsequent RTS processing, as described below.

FIG. 2 illustrates RTS processing, describing the method steps **200** of the present invention that also can be implemented by the system **10** for handling mailpieces to be returned to sender. These method steps can be carried out as a continuing part of the forward mail processing **100** as substantially described above or as an independent processing operation. The initial step of the procedure **200** is to individually scan each of a plurality of mailpieces so as to generate a single-scan image (Block 201) of address indicators. The single scan image is segmented into address blocks (Block 202) and the ABAs identified (Block 207). The address block is compared (Block 203), preferably using an OCR engine (Block 204), to determine a match between the address block indicator such as the USPS's "ZIP + 4" and the ABA (Block 206). If a match is obtained (Block 209), a label will be applied to the mailpiece, as already described, on

which will be printed the sender return address indicator along with an indicator of the reason for returning the mailpiece to the sender (Block 210). The mailcarrier will have originally determined the reason for non-delivery, which can be independently indicated (Block 211). With the procedure **200**, mailpieces can be processed as a batch having all mailpieces to be returned for the same reason. In addition, however, the system **10** and method **200** permit storage of address indicators specifying for each mailpiece addressed to a specific addressee the reason for return. In any event, the system **10** and method **200** will label the mailpiece and print the sender return address indicator and reason for return as described above (Block 210).

FIG. 2 further illustrates that for any mailpiece for which a sender return address indicator **72** is not found in the single-scan image of the front side of the mailpiece, the opposing side of the mailpiece will also have been scanned in order to image any address indicator positioned there (Block 213). If the sender return address indicator **72** is found on the reverse side of the mailpiece, the processing proceeds as already described and culminates in the mailpiece being labeled and the appropriate address indicator and reason for return printed thereon (Block 212). If no address indicator is found on either side of the mailpiece, the mailpiece is nonetheless tagged or labeled (Block 215). An identifying code indicator, preferably a barcode, is printed on the tagged or labeled mailpiece for use in subsequent processing, and

the mailpiece is sorted for subsequent processing (Block 216).

FIG. 3 illustrates the subsequent RTS second pass processing procedure **300**. The procedure **300** is preferably implemented on a system utilizing a processor **16** that is a programmable computer which can be programmed for additional RTS processing. This permits the system **10** as described above to implement the steps **300** utilizing the same system devices. More specifically, the process controller is placed in rerun RTS mode (Block 301). The identifying code indicators applied to each mailpiece during the preceding RTS processing are scanned (Block 302). The scanned image is compared with a set of images stored in a database to determine whether a corresponding address and reason for no deliver at such address (Block 303). If so (Block 304), a label is applied to the mailpiece and on the label is printed a return to sender address indicator **76** along with the reason for return as determined by the comparison with the database images. If no match is made (Block 304), the mailpiece is sorted to a reject stacker for additional processing or disposal (Block 306). If the entire plurality of mailpieces has been processed (Block 307), then the procedure concludes with an end report being generated (Block 308).

The RTS procedure **200** and second pass RTS procedure **300** as implemented by the present invention contrast with conventional procedures such as are employed by the USPS. Conventional procedures require

manual notation on each mailpiece by the individual mailcarrier as to the reason for no delivery; to the degree equipment is employed by USPS in carrying out this procedure at some facilities, it has been to run mailpieces through a cancellation device that applies a notation indicating one of eight reasons for non-delivery of a mailpiece. The RTS procedure **200** and second pass procedure **300** of the present invention, however, utilize scan-generated images and character comparison algorithms that allow for creation of a single-scan image of a receiver location address indicator **62** that can be stored and correlated with an indicator for non-delivery. Having a stored location address indicator **62** that can be matched using a processor to a corresponding reason for no delivery indicator eliminates manual processing and allows for automated generation of a label bearing an indication of the reason for no delivery as well as the sender return address indicator **72**.

FIG. 4 illustrates a 3547 processing procedure 400 according to the present invention. The 3547 procedure, as already noted, is intended to generate a notice to the sender when a mailpiece is forwarded informing the sender of the forwarding address. As already described in the context of forward mail routing, and as further illustrated in FIG. 4, each of a plurality of mailpieces utilizing the present invention is scanned (Block 401), and single-scan images of receiver location address indicators and sender return address indicators appearing on each of a

plurality of mailpieces is generated. The images are stored for subsequent processing (Block 402). The receiver location address indicator **62** and sender return address indicator **72** are identified for each single-scan image (Block 403) As described above, a match is sought for each mailpiece between the receiver address location indicator **62** and a receiver forwarding address indicator **84** (Block 404), preferably using an OCR engine and character recognition algorithms for comparison of the receiver location address indicator with a list of possible return addresses from a database of addresses **701**. If no match is made, the mailpiece is flagged for additional processing as earlier described (Block 405); otherwise the image is flagged for use in generating a sender notification **90**. Once a determination is made that each of the plurality of mailpieces has been scanned and a comparison made (Block 406), the stored single-scan images which have been flagged for generating a sender notification **90** are sorted (Block 407).

Once sorted, the single-scan images of receiver location and forwarding address indicators, along with the sender return address indicators, are displayed in succession (Block 408). Each image in succession is superimposed into a "postage due" template frame along with a destination indicator corresponding to the sender return address indicator **72** in a manner that will facilitate subsequent application on a separate mailpiece. In one embodiment, the destination indicator will be a barcode positioned in

the lower right corner of the template frame. In subsequent processing, it is determined whether the barcode corresponds to a stored return address indicator or must be supplied by a keypunch operator (Block 409). When each of the sorted images has been thus processed (Block 410), the template frames are sorted, for example, according to the USPS "ZIP + 4" system (Block 411), sized appropriately for placing on a sender notification **90** of a predetermined sized (Block 412), and printed on a separate sender notification **90** mailpiece (Block 413). In a preferred embodiment, flat size mailpieces will use a full 8.5" x 11" page (Block 414) while letter size mailpieces will be printed with two images per page (Block 415) on a printer having an automatic page cutter.

Once the sorted images have been processed, sized, and framed for placement on a sender notification **90** of a predetermined size as just described, the image can be sent to any destination for printing a corresponding sender notification **90** mailpiece label. Preferably, the system **10** thus includes one or more remote site printers **800** for performing destination printing. Each destination printer, moreover, is linked to the system processor **16** via a local area network (LAN), the Internet, or any other localized or global communications network as well understood by those skilled in the art.

The 3547 procedure **400** effected by the present invention represents a considerable improvement over conventional procedures. Conventional 3547 mail

processing carried out, for example, by the UPS whereby the sender has requested that if a mailpiece is forwarded to a new address, the sender be notified of the forwarding address, requires the additional manual step of photocopying the front of the mailpiece showing the forwarding address, imposing a considerable burden in terms of time and expense in contrast to procedure effected by the present invention. The manual data entry and extremely laborious step of making multiple photocopies is eliminated by the present invention, effecting a considerable savings in terms of time and mailhandling resources.

As noted above, the USPS defines letters as being larger than 3"wide x 5"long x .007"thick and smaller than 6.125"wide x 11.5"long x .25"thick, and flats as larger than letters but smaller than 10"wide x 13"long x .75"thick. In the present context, it is worth noting that sender notification or other address service request indicators, such as the ACS barcode indicator described above, are difficult to detect. But with the present system and methods, an image is generated before the return label is applied. Therefore, the label can be superimposed on a flat in the lower right corner of the mailpiece, and as necessary, the images can be verified even with high speed processing, as well as with manual or visual inspection, to ensure that the superimposed label does not cover the original address.

FIG. 5 illustrates the corresponding steps for processing off-line those mailpieces flagged for

subsequent processing, according to the procedures described above. These will be images of address indicators for mailpieces which were to be forwarded and the sender notified, but for which no return address was obtained. Initially, the single-scan images generated in earlier processing are again sorted (Block 501) and presented, preferably to a keyboard operator at a video display terminal, each in succession (Block 502). If the image is a repeat of an earlier one presented in the succession of images (Block 503), the operator assigns the preceding return address (Block 504); otherwise the operator attempts to identify on the image a corresponding sender return address indicator, in which case the operator preferably will be able to "point and click" on the indicator (Block 505), as that procedure is understood by those familiar with the relevant art. If the indicator corresponds to a correct sender return address indicator (Block 507), the operator will proceed to the next image if any remain for processing (Block 508). Alternatively, if no correct identification is made, the operator will manually input address information for search using an extraction algorithm (Block 509) against a corresponding list of address indicators, such as the USPS "ZIP + 4".

FIG. 6 illustrates yet another procedure, 3579 processing, that can be effected by the system and methods of the present invention. Such procedure is intended to notify a sender when a mailpiece could not

be delivered, but where the mailpiece itself is not sufficiently valuable to warrant the cost of return postage. The procedure corresponds to and improves upon current mailhandling practices such as the current USPS 3579 processing of second class mail, primarily magazine publications. The USPS procedure requires the mailpieces be sorted and data be entered manually by a keypunch operator to identify a sender notification destination indicator. With respect to magazine publications, the USPS procedure requires that the cover page of the magazine having the receiver location address indicator **62** on it, be torn off and placed in an envelope to be sent to the publisher once the publisher's return address is identified. Thus, with current USPS procedures, 3579 processing entails numerous manual steps including looking up return addresses corresponding to a publication, preparing the return cover sheet, placing it in an envelope and appropriately labeling the envelope with the magazine publisher's address.

The present invention as illustrated in FIG. 6 achieves the same results in a substantially more efficient manner. In the present invention, a database of images corresponding to current publication cover sheets is maintained. Each mailpiece is processed substantially as described in the earlier procedures (as described below, a specific embodiment provides for an apparatus that permits online processing of bound multiple-page mailpieces such as magazines); that is, an exposed page of each multi-page mailpieces is

initially scanned (Block 601). Next, an image indicator is assigned along with an image header (Block 602), and the image number is printed on the exposed page (Block 605), preferably in the lower right corner of the page, and the image and indicator are stored (Block 603). Once each of the plurality of multi-page mailpieces have thus been scanned (Block 604), each stored image is compared with a set of current publication images (Block 606). If a match is made (Block 607), the publisher's address corresponding to the matched database image is placed in the scanned image header (Block 608); otherwise the scanned image is marked for subsequent processing (Block 609).

Once all scanned images have thus been processed (Block 610), the images are sorted (Block 611), preferably by arranging the header in accordance with the image indicator. Those images for which no return address has been identified through an initial match and which have been marked for subsequent processing, are pulled (Block 612) and sorted according to pattern criteria. They are then displayed in succession to an operator, preferably positioned at a keyboard and video display terminal. For each image thus displayed, the operator will provide a shortened extraction code (Block 613) representing the publication name, which is then compared against an existing database of publication names and addresses (Block 614). Because the images have already been sorted according to pattern criteria, the operator can simply use a repeat key for subsequent identically

patterned images once a determination has been made. When a match is made (Block 615), the image will be flagged with the corresponding address and put it in the printing buffer. Otherwise, the operator must pull the magazine based on the image number printed on the front, find the publication address (Block 616) and input the address where it will be included in the database of publication names and addresses. The mailpiece then will be included in the printing buffer.

After an address indicator has been determined for each image, a printing procedure commences. Mailpieces are sorted according to the destination address and volume of multiple images. The mailpiece is printed within a "postage due" frame **92** that includes a sender return address indicator and other indicator, preferably a postnet or planet barcode, **94** corresponding to the sender's address (Block 618) (see FIG. 10). Multiple images being sent to the same address will print at the end with a cover sheet indicating the total postage due, the publication address, and any corresponding postnet or planet barcode (Block 619). All the images and corresponding cover sheets are folded and either tabbed or stapled closed before sending to the publisher or other multi-page mailpiece sender. Thus, 3579 processing **600** according to the present invention represents a significant advance over conventional 3579 processing, such as carried out the USPS, in which publisher addresses are continually looked up manually and cover pages are separated and individually placed in

envelopes to be addressed to the respective magazine publishers.

Even greater efficiencies are achieved by utilizing the networked destination printing described above in the context of 3547 processing. In the context of 3579 processing, images and address indicators are, again, sized and framed for placement on a notification mailpiece of a predetermined size. The images, also again, can be forwarded to any one of a plurality of printers **800** at remote sites for printing to a label on the corresponding sender notification mailpiece, wherein each destination printer is linked to the system process **16** via a local area network (LAN), the Internet, or any other localized or global communications network.

FIGS. 11-12 illustrate the preferred elements of the system **10** according to the present invention. In addition to the mailpiece feeder **11**, mailpiece transporter **20**, mailpiece labeler **28**, mailpiece stacker **30**, and process controller **16** having forwarding address determiner **17**, return-to-sender determiner **18**, and sender notification determiner **19**, the system **10** also includes a reverse side imager **27** to image a sender return address indicator **72** positioned on a reverse side of a mailpiece. As illustrated in greater detail in FIGS. 13-16, the reverse side imager **27** interposes a sender return address indicator **72** image **96** into the single-scan image of the receiver location address indicator **62** and sender notification indicator **74** positioned on the front side of each of the plurality

of intermixed mailpieces created by the mailpiece scanner, to thereby create a single data block image comprising receiver location address indicator **62**, sender return address indicator **72**, and sender notification indicator data **74** (FIG. 14). Preferably, the reverse side imager **27** is a mirror or mirrors positioned along side the mailpiece transporter **20**, so as to efficiently reflect a mirror image **96** of a return address indicator **72** positioned on a reverse side a mailpiece. In addition, the process controller **16** preferably includes a reverse image translator **31** to re-orient the reflected mirror images, so that the mirrored image **96** is reversed so that a resulting image **98** corresponds substantially to the return address indicator **72** as it appears positioned on the mailpiece (FIG. 16).

As further illustrated in FIG. 11, the process controller **16** preferably also includes an additional processing mailpiece processor **32** to detect which mailpieces require additional processing and to instruct the labeler **28** to label each mailpiece requiring additional, or second pass, processing before mail routing with a second pass processing indicator uniquely identifying the corresponding mailpiece for subsequent additional processing. The process controller **16** preferably includes, as well, a data receiver **33** positioned to receive and store system-user-supplied data for each mailpiece which has the unique second pass processing indicator. The relevant data, usually providing a better indication of

receiver's or sender's address, is supplied to the data receiver **33** by a user remote from the system **10**. During second pass processing, each mailpiece is uniquely identified by its second pass processing indicator and, in response, the mailpiece labeler labels the mailpieces with the system-user-supplied data corresponding to that mailpiece's unique second pass processing indicator.

Preferably, the process controller further includes an image storer **34** and an image matcher **35** responsive to the user-supplied data to match stored images to a corresponding mailpiece. The labeler **28** of the system **10** preferably also includes a stored address image labeler **36**, the labeler being in communication with the process controller **16** and positioned to label a mailpiece with a stored image of a return address indicator **72**. In addition, the labeler **28** includes a stored notice image labeler **37**, as well, to label a preselected mailpiece with a stored image of a sender notice **90** (see FIG. 10).

In order to process both letters and flat mail on the same system **10**, the rate at which mailpieces are fed onto the path of travel **21** of the mailpiece transporter **20** preferably is variable. The mailpiece transporter preferably includes a variable speed controller **45** which determines the number of mailpieces processed per minute by speeding up or slowing down the number fed into the system, thereby increasing or decreasing the gap between successive mailpieces undergoing processing (FIG. 11). Other techniques for accommodating differently sized

mailpieces on the same system, for example by varying the speed of conveyance of mailpieces by the transporter **20**, will be apparent to those skilled in the art. Moreover, the system **10** will provide size-adjustable stackers to permit operating the same system on mailpieces ranging in size from substantially 3"wide x 13"long x 0.75"thick, commonly defined as letter size, up to and including 10"wide x13"long x0.75"thick, commonly defined as flat mail.

To accommodate margin-bound multi-page mailpieces such as magazines, the mailpiece transporter **20** includes vertical pinch belts **15**, each movably mounted on a plurality of mechanically driven rollers **14** and extending substantially parallel to one another along the predetermined path of travel **21**, and the feeder **11** preferably includes a vacuum assist device **12** to transport individual mailpieces. Preferably, the speed of the vertical pinch belts is at least 35 inches per second. In addition, the mailpiece scanner preferably is able to scan at least 5,000 mailpieces per hour. To effectively scan or "read" small print borne on a mailpiece, the mailpiece scanner **25** has a resolution of about 250 dots per inch ("dpi") to scan fonts commonly used for preprinted return addresses on mailpieces.

Moreover, to ensure that single-scan images of address indicators can be converted into an image to fit on a label within a predetermined area of a specific size, the process controller preferably includes an image sizer **38** to adjust the size of a sender notice to fit completely and legibly within the parameters of a 8.5"x11" mailpiece surface on which

appears a sender address indicator **72** while permitting the borders of said mailpiece to be framed with a "postage due" notice **92** (see FIG. 10).

In order to complete a procedure during a single pass of a mailpiece around the path of travel **21**, the mailpiece labeler **28** preferably includes a multiline ink jet printer **29** having at least a three-line capability to simultaneously print at least three lines so as to ensure that an address indicator and sender notice to be positioned on a mailpiece, having been scanned and labeled, are printed thereon as the mailpiece is conveyed in a single pass along the predetermined path of travel **21** by the mailpiece transporter **20**.

As further illustrated in FIG. 11, the scanner preferably is in communication with a cover sheet imager **39** that can scan an exposed page of a multipage mailpiece, including magazine publications comprising a plurality of pages bound together at the pages' margins, so as to thereby create and store single-scan images of the exposed page of bound multi-page mailpieces. In addition, the process controller **16** preferably includes a multipage mailpiece sender notifier **41** to match the single-scan image of the exposed page of a multipage mailpiece with a corresponding image in a collection of images of exposed pages of preselected multipage mailpieces and to thereby identify a sender address indicator **72** corresponding to the single-scan image. The multipage mailpiece sender notifier **41** is positioned to be responsive to a match made by the multipage mailpiece sender identifier **40**, so as to thereby cause the

mailpiece labeler **28** to position a sender notification on the exposed page of the corresponding multipage mailpiece.

To effect notification of a sender when a mailpiece is forwarded and to inform the sender of the forwarding address, the process controller preferably includes a forwarding notification generator **42** responsive to a sender notification indicator **74** placed on a mailpiece so as to generate an image of the corresponding location address indicator **62**, forwarding address indicator **84**, and return address indicator **72**, to thereby instruct the mailpiece labeler to label a separate mailpiece with the corresponding image of location address indicator **62**, forwarding address indicator **84**, and sender return address indicator and generate a sender notification mailpiece **90** to be sent to the sender indicating the forwarding address corresponding to the receiver's location address. The forwarding notification generator **42** preferably includes a postage due report generator **43** to sum the number of mailpieces to be sent to senders indicating the forwarding address corresponding to corresponding receivers' location addresses and computing the total postage due thereon. As already described, the process controller preferably includes an OCR, which, in conjunction with a character comparison algorithm, compares the single-scan image generated by the mailpiece scanner **25** with a preselected set of receiver location address indicators each having a corresponding forwarding address indicator, so as to determine the forwarding address indicator to appear on the system-labeled mailpiece to be forwarded to the address indicated by the forwarding address indicator **90**.

Consistent with the mail forward procedure described, the process controller **16** preferably includes reason-for-return notification generator **44** responsive to the return-to-sender determiner **18** to instruct the mailpiece labeler **28** to label a mailpiece to be returned to sender with an indicator indicating the reason for the return selected from a list of different reasons for returning the mailpiece to the sender.

FIG. 12 perhaps best illustrates an apparatus according to the present invention for performing each of the above-described mail handling procedures **100, 200, 300, 400, 500, 600,** the apparatus preferably including a mailpiece transporter **20**, which includes: a mailpiece conveyor **22** to convey each of a plurality of mailpieces along a predetermined path of travel **21**; a mailpiece receiver **50** positioned upstream from the mailpiece conveyor **22** at the initial point of the path of travel **21** to receive each mailpiece for subsequent conveyance along the preselected path of travel **21**; and a mailpiece dispenser **51** positioned downstream at the terminal point of the path of travel to dispense each mailpiece. The apparatus preferably includes, as well, a scanner **25**, preferably an optical character reader to read data positioned on each mailpiece and generate an image of the address data. The apparatus further includes a labeler **28**, such as an input-output processor and inkjet printer **29**, positioned along the path of travel **21** of the mailpiece transporter **20** downstream from the labeler **28** for labeling each of the plurality of mailpieces with a preselected routing indicator. The apparatus includes a control processor

16, preferably a programmable computer, in communication with the scanner **25** and labeler **28** to receive single-scan images from the scanner **25**, separate each image into discrete data groups having at least address indicators **62, 72, 84** and instruct the labeler **28** to label each of the plurality of mailpieces with the preselected routing indicator. The process controller is programmed, preferably using software procedures as well understood in the art and responsive to the location address indication data group, to determine when the receiver address of a corresponding mailpiece corresponds to one of a list of forwarding addresses forming a forwarding address database stored on the processor **16** or on a separate medium in communication with the processor **16** and to instruct the labeler **28** to label the mailpiece with the listed forwarding receiver address **84**. The processor similarly is programmed to determine for mailpieces to be returned to a sender the reason why. Accordingly the processor is programmed to instruct the labeler **28** to label the mailpiece with a corresponding sender return address indicator **74** along with a reason for return indicator.

The processor **16** is also programmed to detect mailpieces requiring additional processing and to instruct the labeler **28** to label the mailpieces with reprocessing indicators identifying such mailpieces for subsequent additional processing. The processor receives supplementary data from a system user, preferably supplied by the user via a keyboard and

display terminal. The user-supplied data corresponds to the data indicated as necessary by the unique reprocessing indicator needed for completing a specific mailhandling procedure.

The processor **16** also stores images or is in communication with a medium having a database for storing images of the receiver location address indicators **62**, the forward-addressing-means-determined forwarding address indicator **84**, and sender return address indicator **72** for subsequent processing and for generating sender notification in mail forwarding procedure **100** and addressing a reason-for-return marked mailpiece. The processor likewise is programmed to produce a postage-due report generator **43** to sum the number of mailpieces to be sent to senders indicating the forwarding address corresponding to corresponding receivers' location addresses and computing the total postage due thereon.

The processor **16** is similarly programmed to compare scanned images of receiver location address indicators **62** for mailpieces not deliverable for some reason with list of addresses stored on the processor or in a database on a separate medium in communication with the processor **16** so as to determine the return. If no corresponding address is found, additional processing is performed, but once having determined why mail is undeliverable at a specific address, the address and corresponding reason will be stored in the database. The processor, in any event, is further programmed to instruct that the labeler label a mailpiece and generate an indicator as to why the

mailpiece is being returned, which is applied to the label.

The processor **16** is also programmed to store images or access a database of stored images corresponding to a collection of current periodicals, circulars, and magazines not worth returning to a sender if not delivered but for which a non-delivery notice is desired by the sender. Again, preferably using an optical character reader, the apparatus scans and images an exposed page of a mailpiece having no sender return address indicator positioned thereon, and compares the image with the stored images to determine a sender address indicator **72**. The processor **16** is further programmed so that, having made such a determination, the processor instructs the labeler **28** to label a mailpiece and generate an image to be applied to the label bearing a sender return address indicator. Preferably, the processor **16** is programmed to sort the discrete images so as to process seriatim all those images to be sent to the same sender.

FIGS. 1-16 further illustrate the methods of the present invention for carrying out forward mail processing **100**, RTS processing **200**, second pass RTS processing **300**, 3547 processing **400**, offline processing **500**, and 3579 processing **600**. The method aspects of the present invention preferably include generating electronic images of receiver location address indicators and sender return address indicators positioned on each of a plurality of mailpieces. Moreover, the method includes determining a corresponding receiver forwarding address indicator by searching for a match between each receiver location

address indicator and a corresponding receiver forwarding address indicator for each mailpiece by making an electronic comparison between the image and a preselected set of corresponding forwarding address indicators. The methods further include searching for the presence of a sender notification indicator positioned on each mailpiece. Also, the method includes generating and positioning a forwarding address indicator on each mailpiece having a match between the receiver location address indicator and the receiver forwarding address indicator. The method further includes generating and storing a sender notification for each of the plurality of mailpieces bearing a sender notification indicator, the sender notification including the receiver location address indicator, receiver forwarding address indicator, and sender return address indicator.

Additionally, the method aspects of the present invention include off-line processing, wherein address indicator data is supplied manually for each mailpiece not having a match between the receiver location address indicator and the receiver forwarding address indicator, and wherein the address indicator is subsequently positioned on the corresponding mailpiece. In addition, the methods include positioning the generated and stored sender notification on a separate mailpiece for each of the plurality of mailpieces bearing a sender notification indicator and routing the separate mailpiece to the sender return address indicator.

The method aspects corresponding RTS processing include generating electronic images of receiver location address indicators and sender return address indicators positioned on each of a plurality of mailpieces. The methods further include determining a corresponding receiver forwarding address indicator by searching for a match between each receiver location address indicator and a corresponding receiver forwarding address indicator for each mailpiece by making an electronic comparison between the image and a preselected set of corresponding forwarding address indicators. Moreover, the method includes searching for the presence of a sender notification indicator positioned on each mailpiece. The method also includes generating and positioning a forwarding address indicator on each mailpiece having a match between the receiver location address indicator and the receiver forwarding address indicator, as well as generating and storing a sender notification for each of the plurality of mailpieces having positioned thereon a sender notification indicator, the sender notification including the receiver location address indicator, receiver forwarding address indicator, and sender return address indicator.

These and other valuable uses of the present invention will come to mind for those skilled in the relevant art. Indeed, many modifications and other embodiments will come to the mind of one skilled in the art and having the benefit of the teachings present in the foregoing descriptions and the associated drawings.

Therefore, it is to be understood that the invention is not to be limited to the specific embodiments disclosed herein, and that the modifications and alternative embodiments are intended to be included within the scope of the appended claims.